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CR 1.1

Regular reflector: water or mirror

Diffuse: bumpy surface - wall

1.2 no

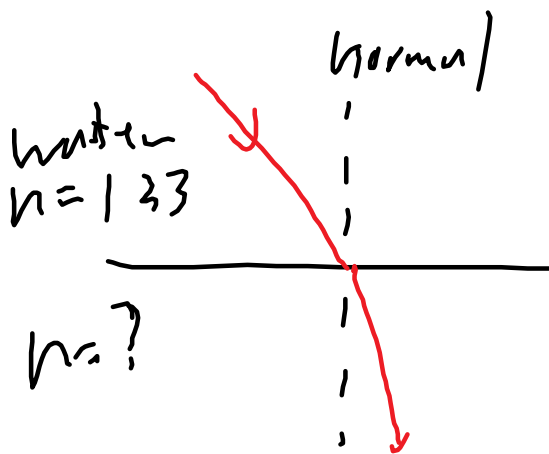
You could go past the critical angle

Sines of the angle are proportional, not the angles.

$$\sin(20) = 0.342020143325669$$

$$\sin(40) = 0.642787609686539 \text{ not double}$$

1.3



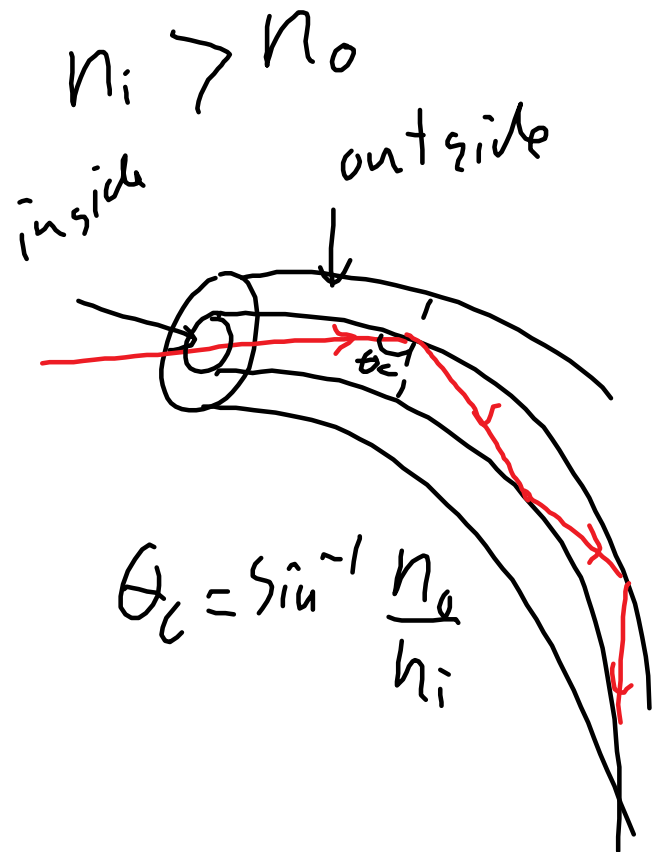
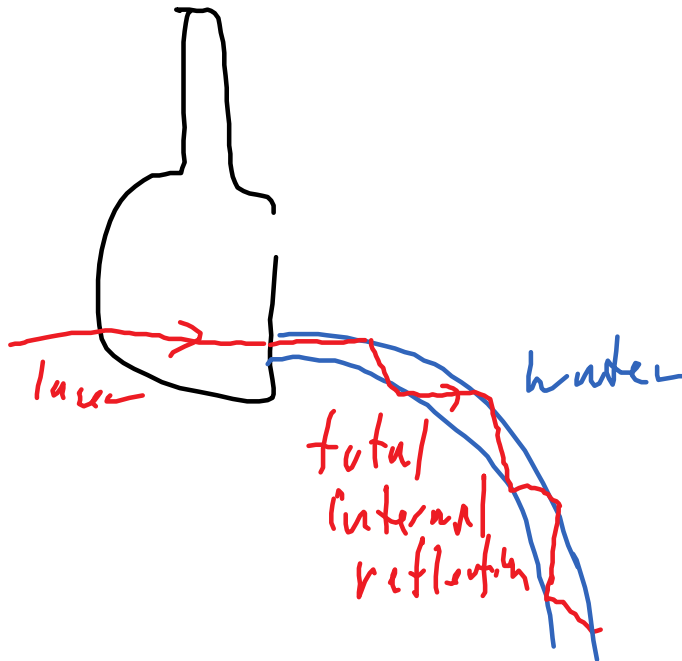
$$1.33 < n < 1.5$$

1.4 $n < 1$? $v = ?$
no, can't be less dense than vacuum

or faster than light

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□ 1.1 fibre optic cable:



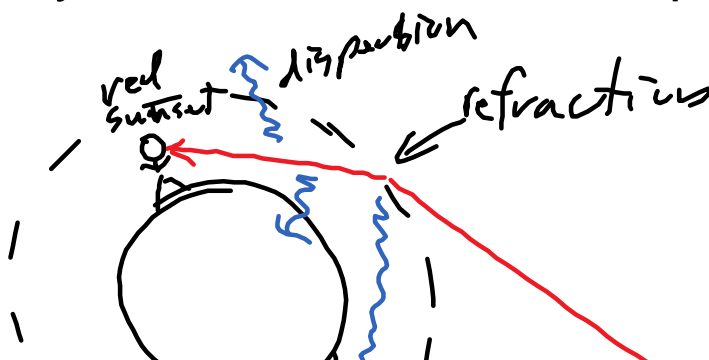
2.2 $n_{\text{glass}} = 1.5$ $n_{\text{water}} 1.33$

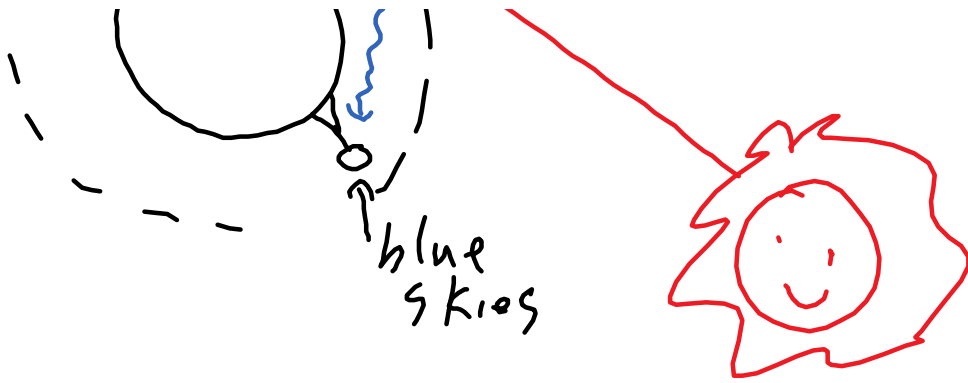
Glass to water, critical angle = $\sin^{-1}(1.33/1.5) =$

Critical angle = 62°

Water to glass: no critical angle

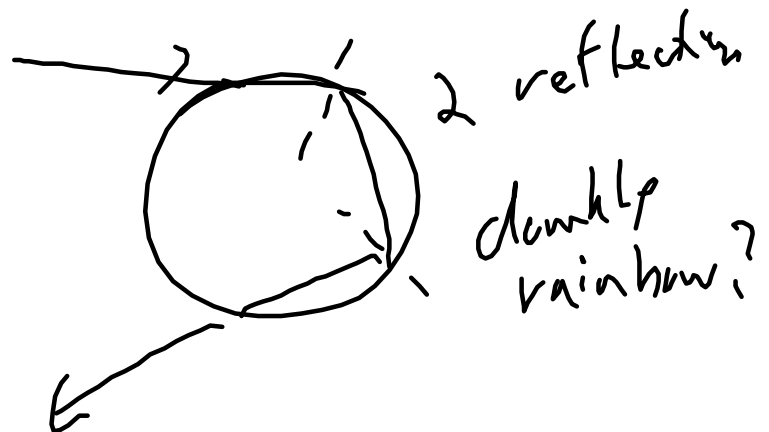
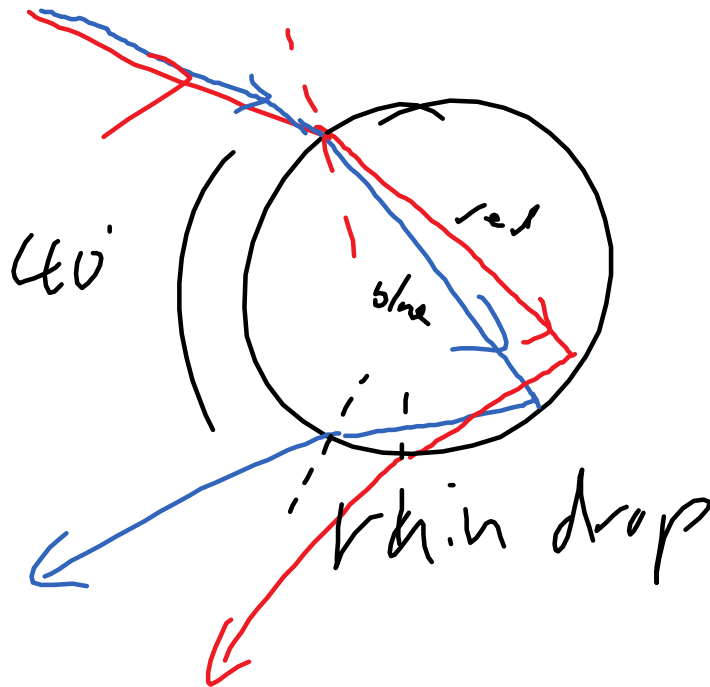
2.3 rays refract into the atmosphere



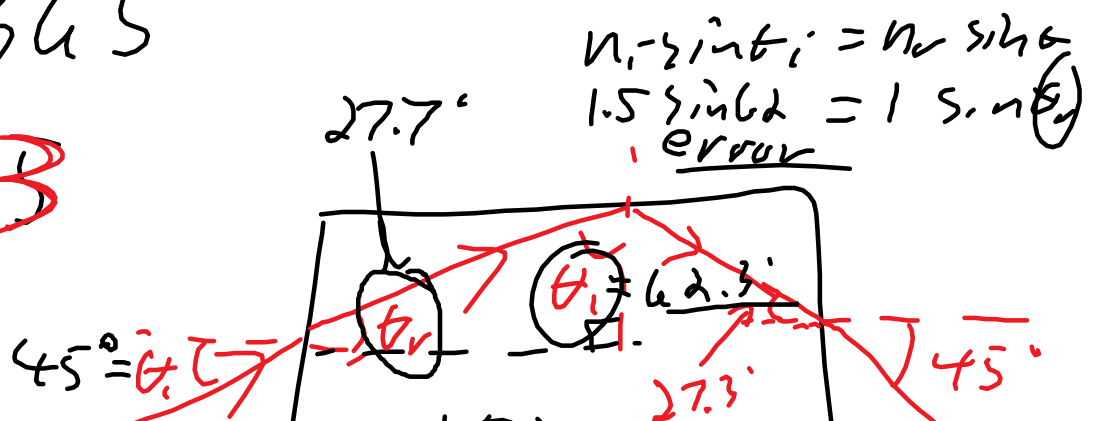


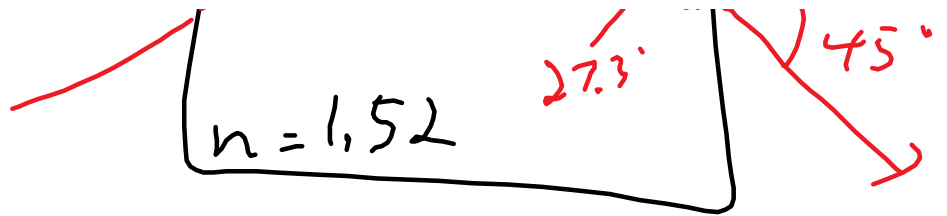
2.4 rainbow white light

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Q23





$$n_i \sin \theta_i = n_r \sin \theta_r$$

$$1.0003 \sin 45^\circ = 1.52 \sin \theta_r$$

$$\theta_r = \sin^{-1} \left(\frac{1.0003 \sin 45^\circ}{1.52} \right)$$

Q25 $n = 2.410$ red $\frac{2.7.72^\circ}{\theta_r = \left(\frac{n_i \sin \theta_i}{n_r} \right)}$
 $n = 2.450$ blue $\uparrow \sin^{-1}$
 $\theta_i = 30.0^\circ$
 $\theta_r = \sin^{-1} \left(\frac{\sin 30^\circ}{2.410} \right)$
 \uparrow
 2.450

1197
11.78°

Study for test.

Look in the mirrors at the window.

Describe what you see.

Draw a ray diagram to explain your observations.

Bonus:

$$445\text{Hz} = 440\text{Hz} \left(\frac{\frac{1500}{\cancel{343} + v}}{\frac{\cancel{343} - v}{1500}} \right)$$

$$445 \left(\frac{1500}{\cancel{343} - v} \right) = 440 (1500 + v)$$

$$445(1500) - 440(1500) = (445 + 440)v$$

$$V = 8.5 \text{ m/s}$$

Q1 $\underline{v = \lambda f = \lambda}$

\textcircled{T}

$$\lambda = vT$$

\uparrow
343

Q2 a) $d = v \frac{t}{2} = \underline{1500 \text{ m/s}} \frac{t}{2}$

$\textcircled{2}$ reflected

b) Nee yk ~~~~~

↑
Higher
approaching
∴ Sub approaching

3) $L = \frac{(2n-1)\lambda}{4}$ $n = 1$

$L = \frac{1}{4} \lambda$

$\lambda = \frac{v}{f} = \underline{\underline{343 \text{ m/s}}}$

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CR 1.1

diffuse reflector: bumpy surface - wavy
water, wall

Normal reflector: mirror, calm water (you can
see your reflection)

1.2 if you double angle of incidence,

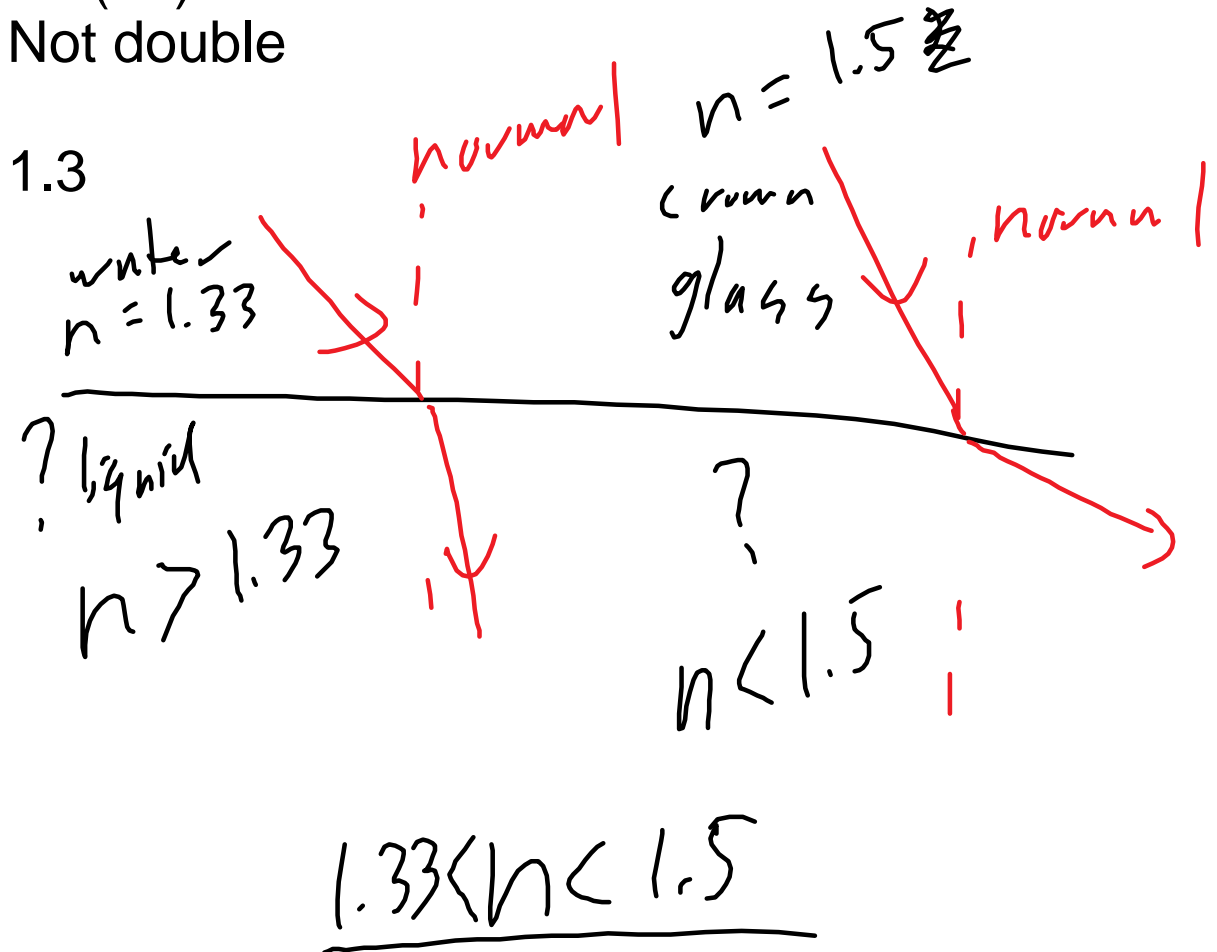
- a) The angle of reflection doubles
- b) Doesn't double - not a proportional relationship

The sines of the angles are proportional

$$\sin(20) = 0.342020143325669$$

$$\sin(40) = 0.642787609686539$$

$\sin(40) = 0.642787609686539$
 Not double



1.4 could n be less than 1?

Yes because yes????

$v = c/n$ if $n < 1$ then $v > c$ not possible according to Einstein

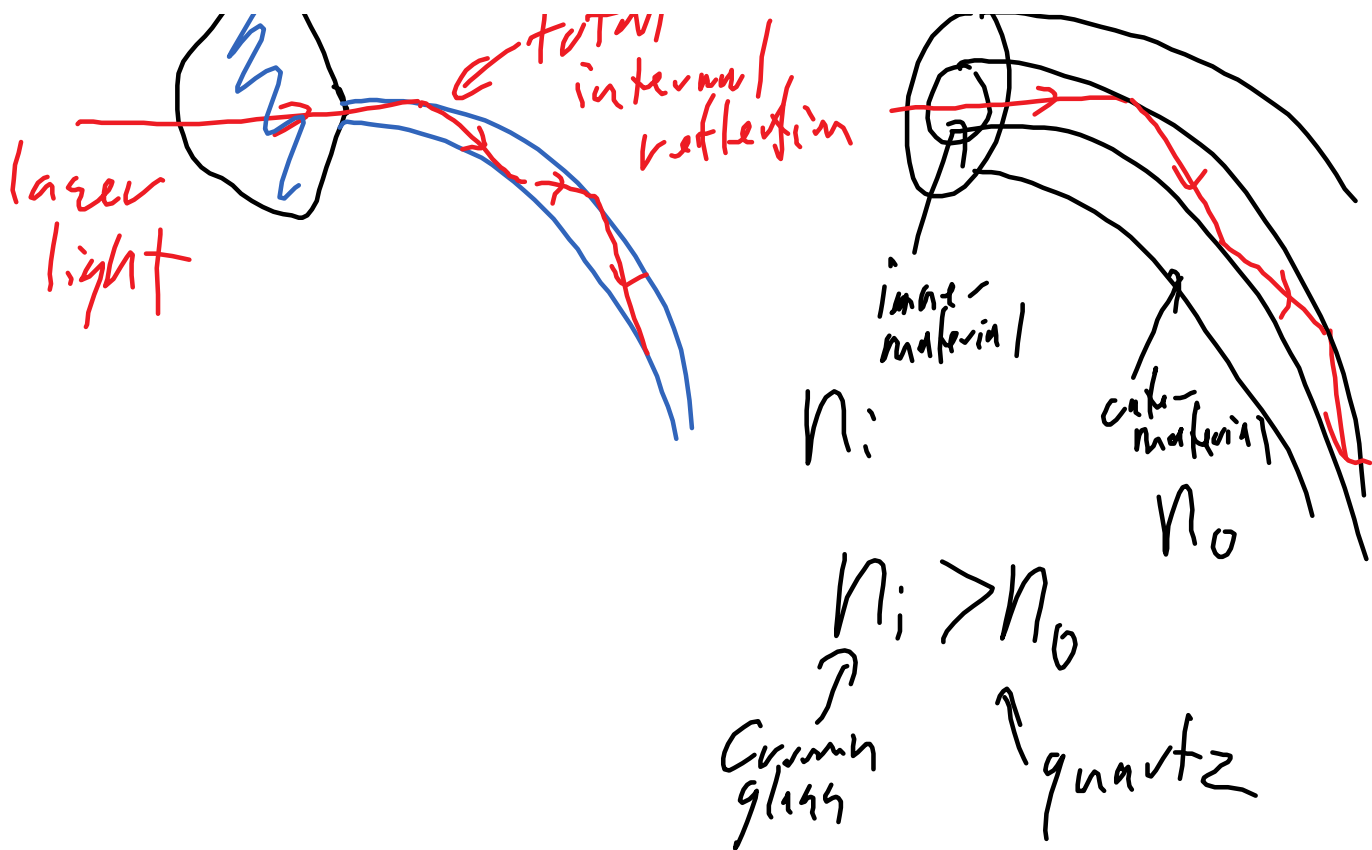
Answer NO because Einstein

Nothing is less dense than a vacuum.

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CR2.1 Quarz and Crown glass for optical fibre.





2.2

Critical angle of light going from water to glass? Glass to water?

$$n_{\text{water}} = 1.33 \quad n_{\text{glass}} = 1.52$$

$$n_i \sin \theta_i = n_r \sin \theta_r$$

Critical angle $\theta_r = 90^\circ$

$$\theta_i = \sin^{-1}(n_r/n_i)$$

$$\theta_i = \sin^{-1}(1.52/1.33) \text{ from water into glass}$$

Erin : undefined (error on calculator)

No critical angle from water to glass

$$\theta_i = \sin^{-1}(1.33/1.52) = 61^\circ \text{ from glass to water}$$

2.3

